Charm/Bottom separation

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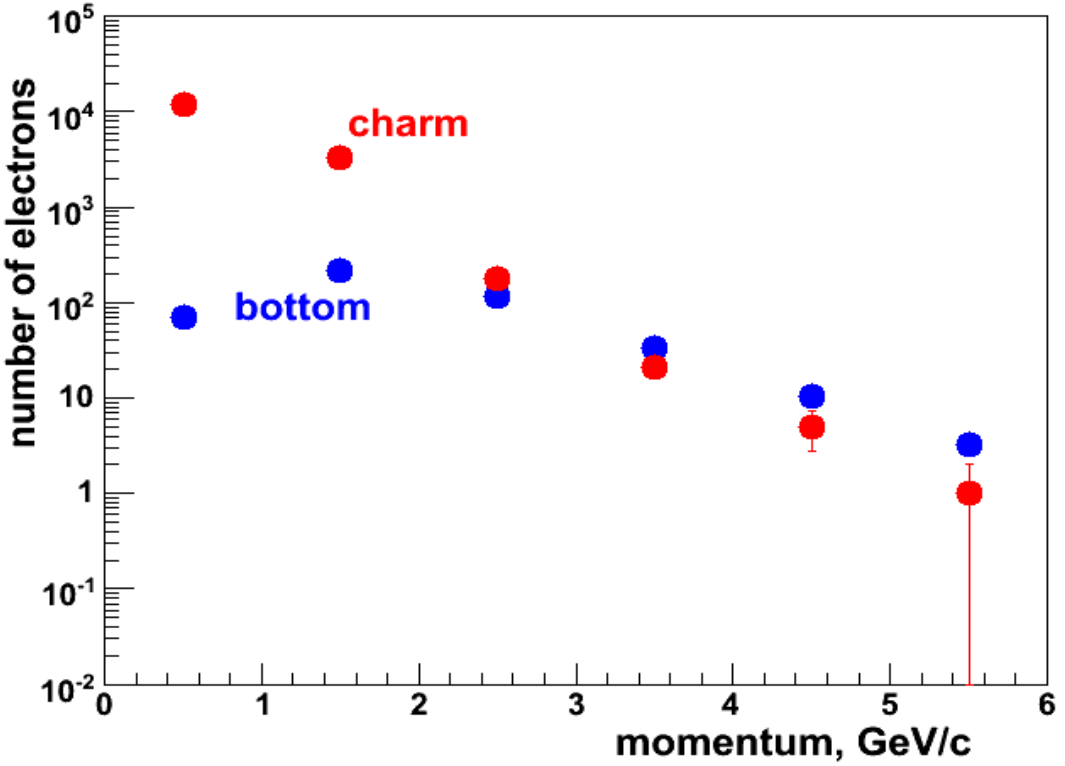
D and B mesons from PYTHIA

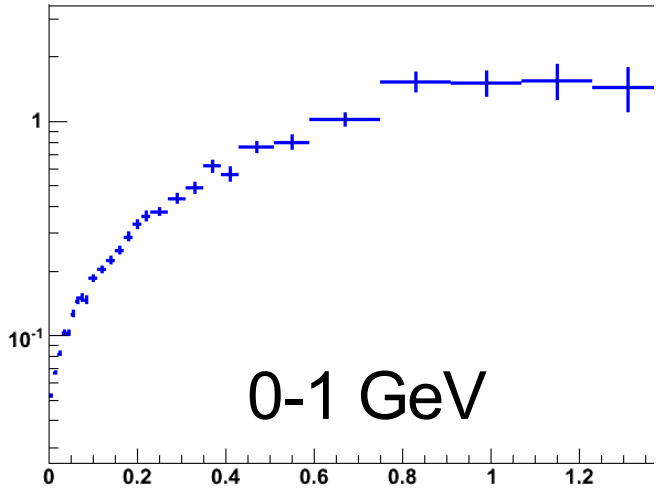
- Single D and B mesons from PYTHIA, decaying to electrons.
- D^0, D^+, D^{--}, and B^0, B^+, and B^{--} only were used.
- Two data sets for D mesons:
  - ckin(3)=0. (default); for this sample b/c ratio is properly normalized
  - ckin(3)=10. For high P_T range
- Full simulation and reconstruction

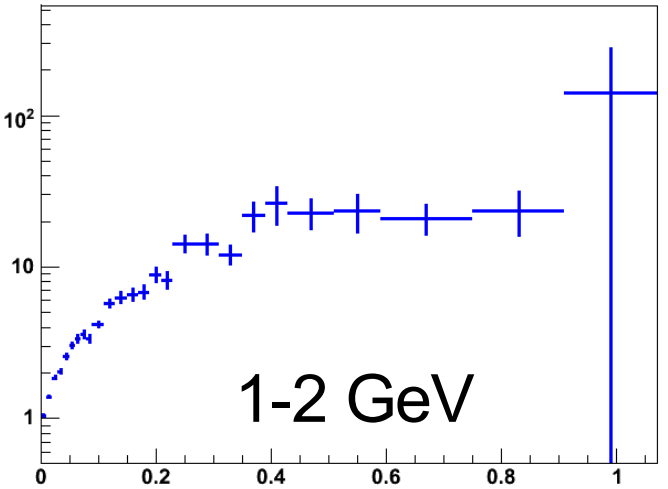
Expected electron yield (electrons from B scaled down) after 3σ DCA cut:
The plot corresponds to ~1.7B min. bias pp events (~1% of run5pp)

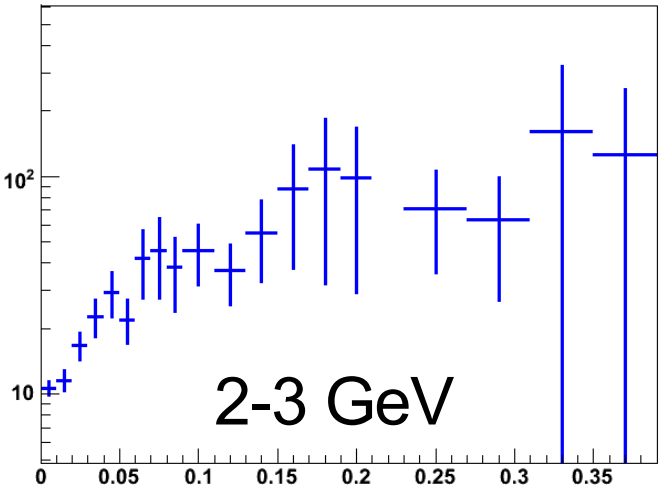


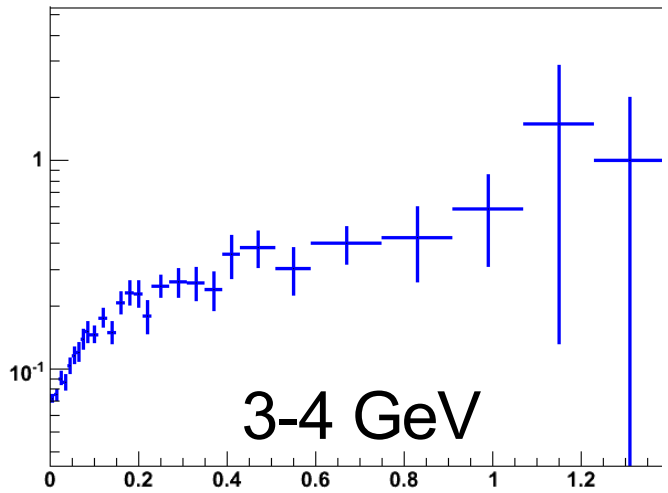
B/C ratio vs DCA from Geant info (fkin)

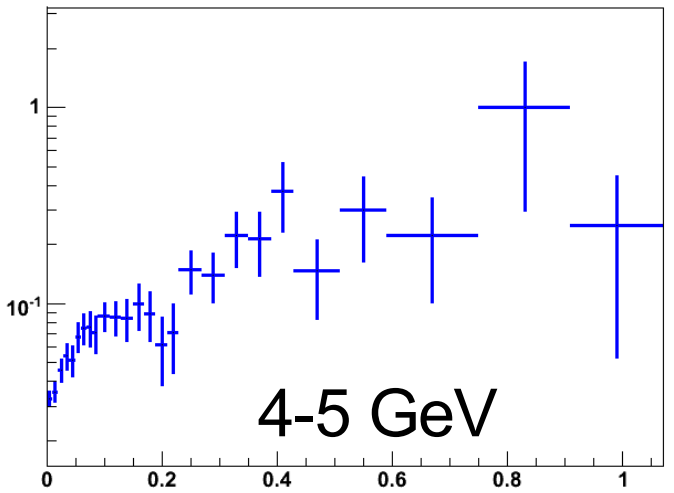
This is what we can get with a perfect detector

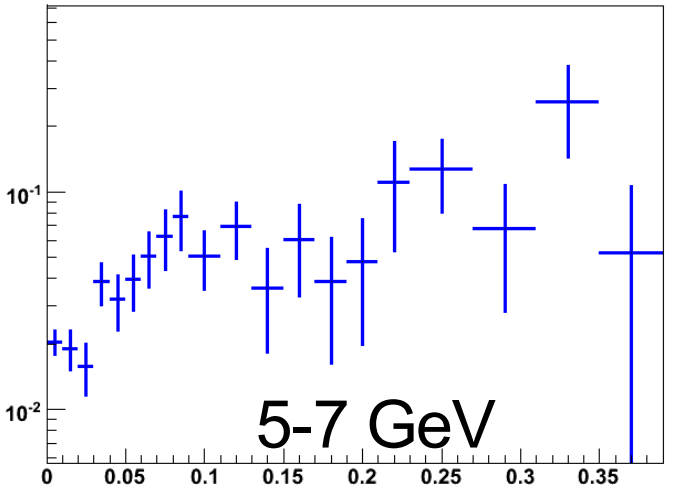








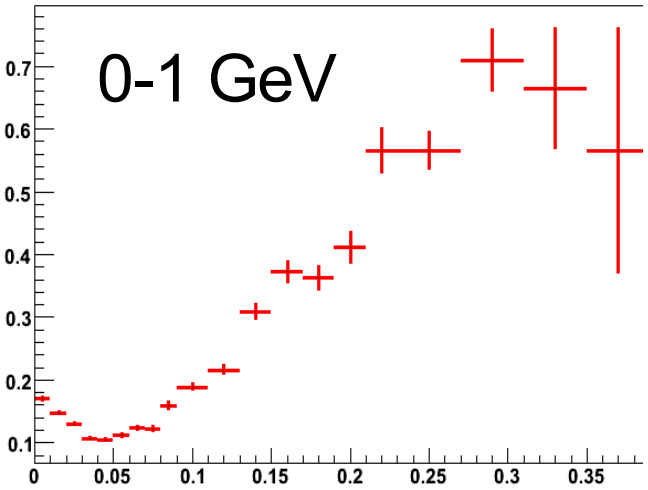


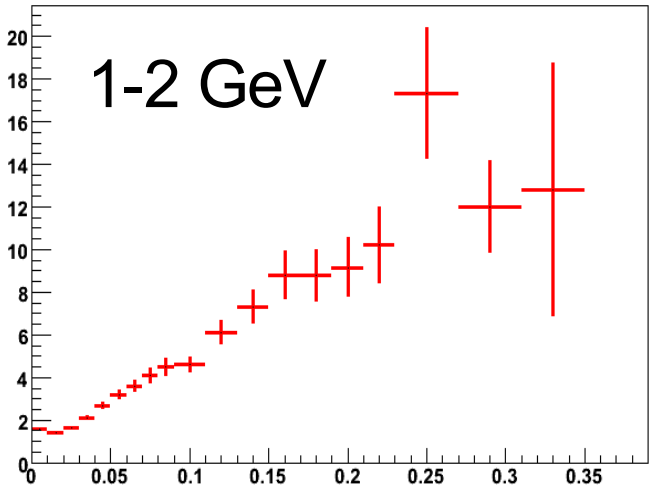


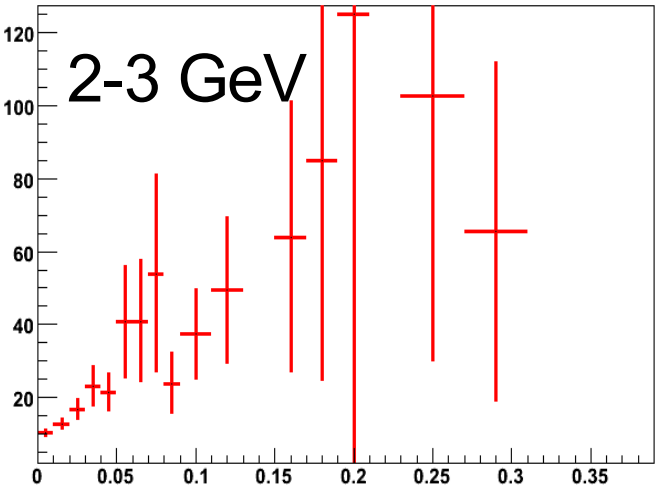
These plots are NOT properly normalized

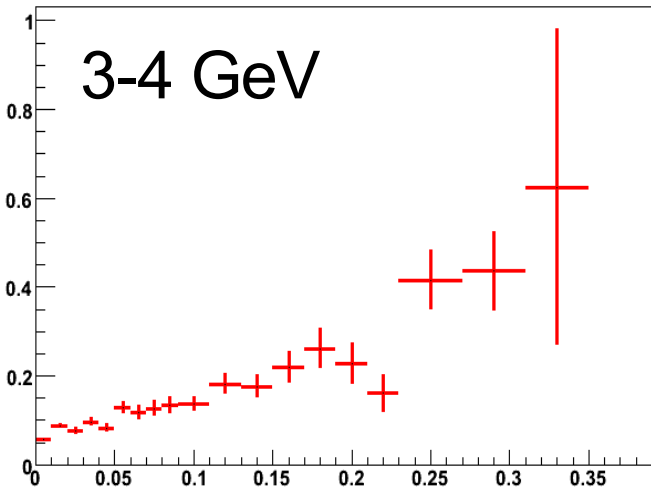
B/C ratio vs DCA from SVX two pixel layers

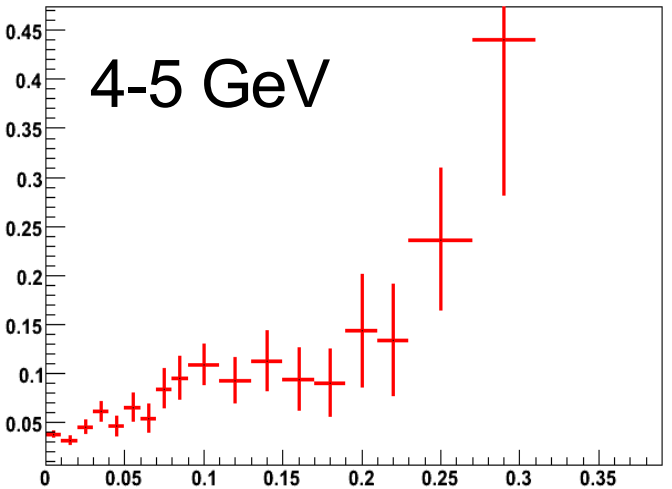
SVX clusters are associated using global tracking (cgl).
Will try SVX standalone tracking next.

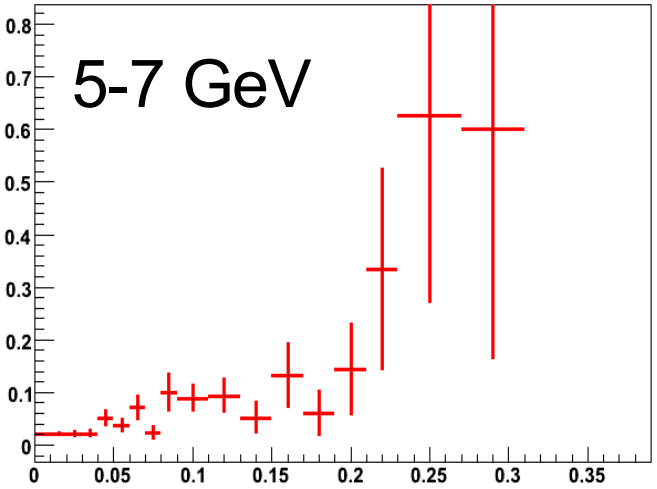












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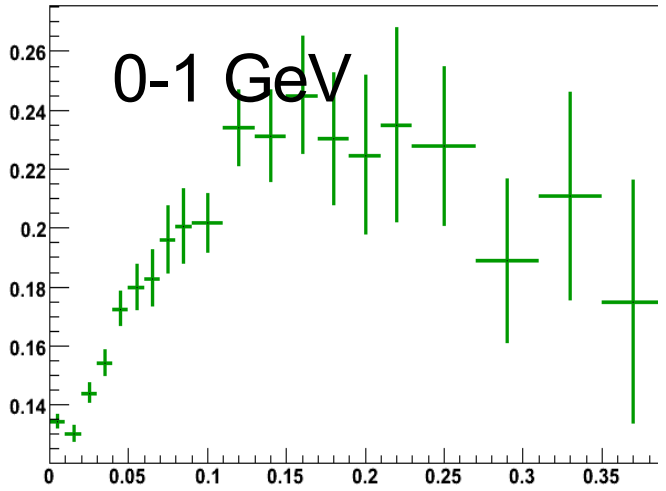
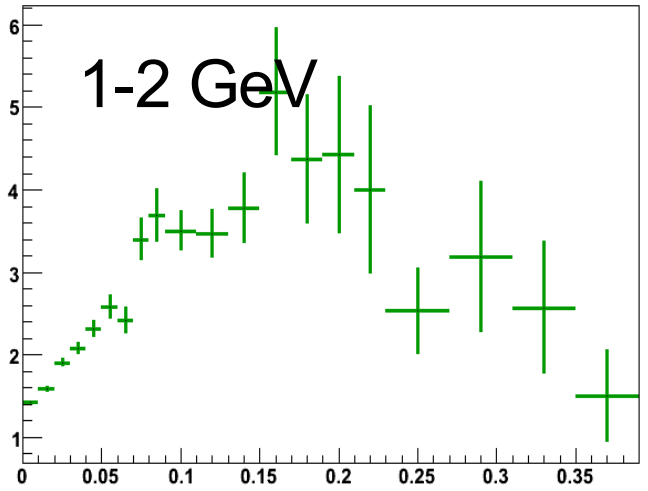
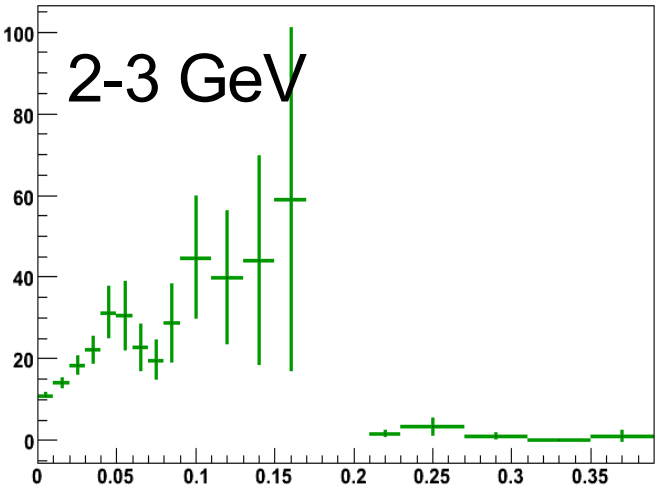
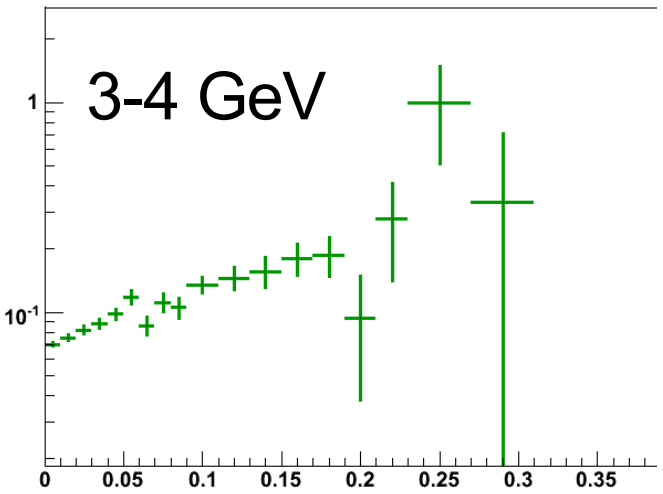
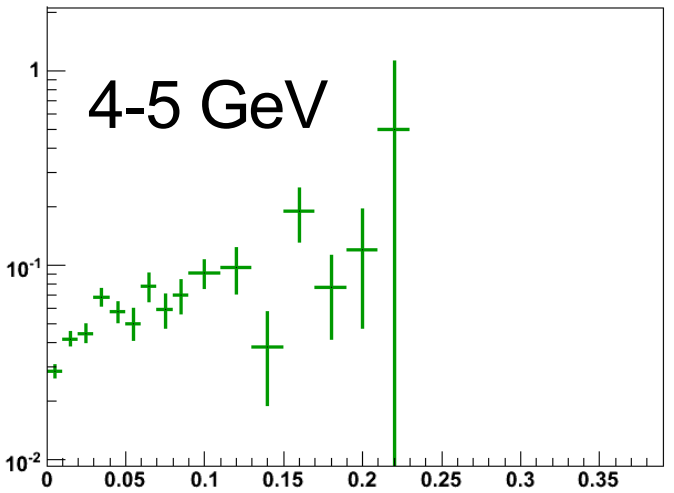
B/C ratio vs DCA from KalFit

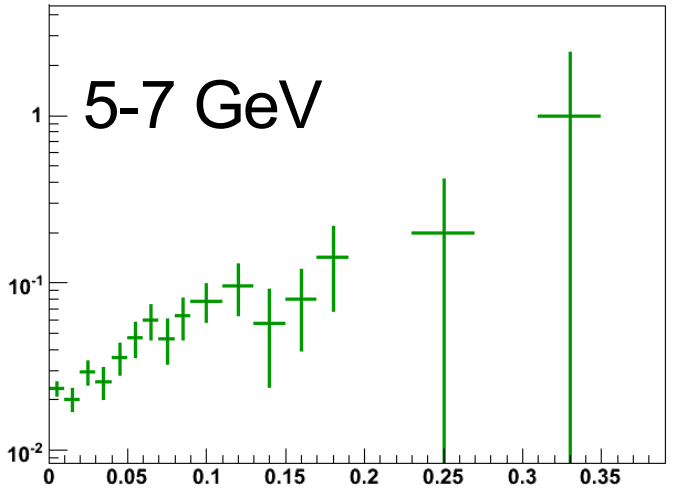












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Conclusions and outlook

- Both SVX DCA and KalFit DCA work

- No high DCA entries in both (cgl problem?)

- Will check cgl and run standalone VTX tracking to determine DCA

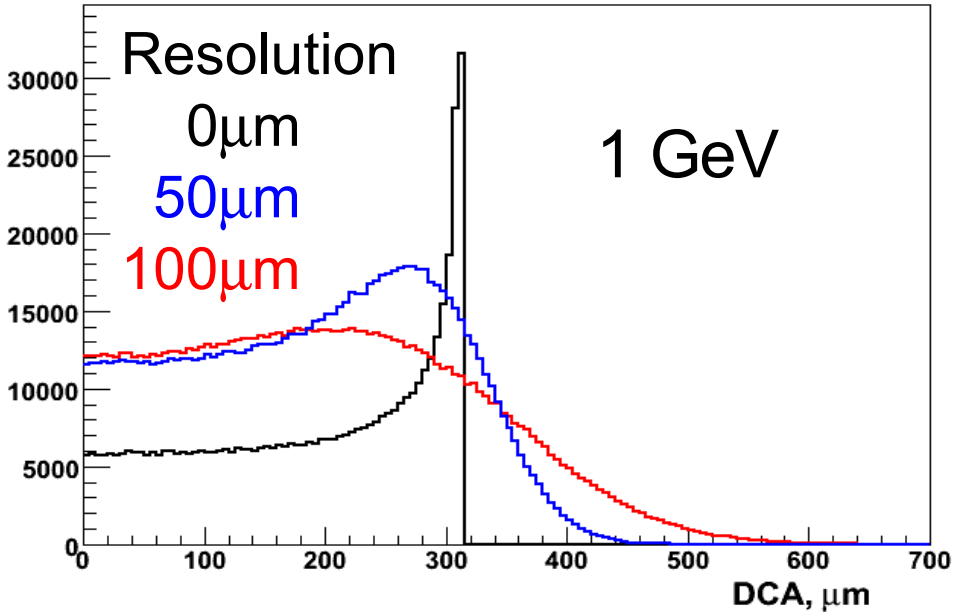
- Separation is worse at high P_T. Is this because of Lorentz boost?

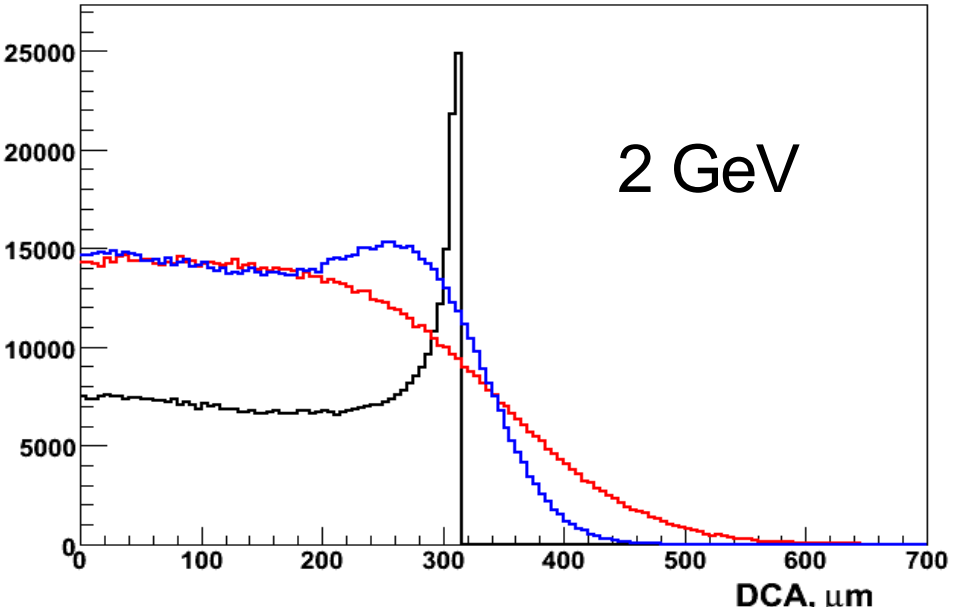
Backup slides

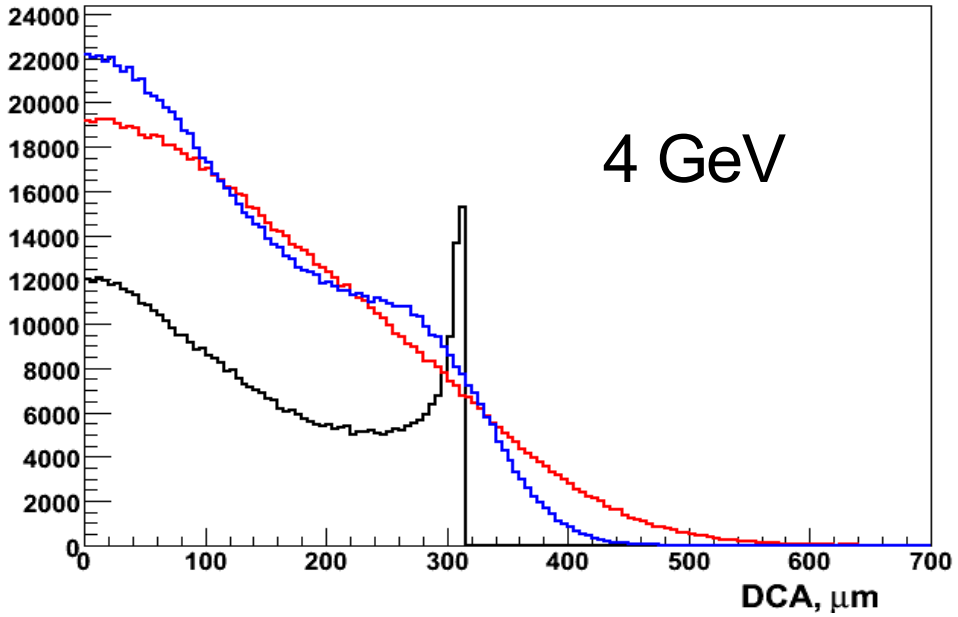
Toy model

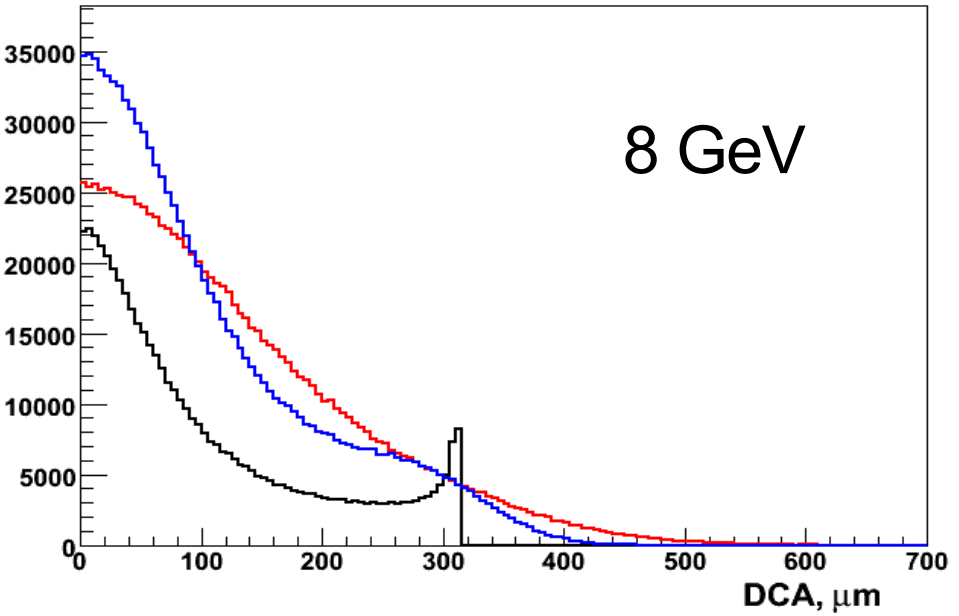
- Decay D mesons at 312 μm from the vertex ($c\tau$) to e and ν
  - this never happens; the most probable decay is K$e\nu$, but for simplicity...
- Decay is uniform in D rest frame, and then electron is boosted by D momentum.
- Perfect DCA is calculated, neglecting magnetic field.
  - we assume perfect DCA resolution and perfect vertex knowledge.
- This is the best we can expect for decays away from the vertex.
- Add some DCA smearing (Gaussian) to see how it affects results.

Toy model results vs D meson P_T





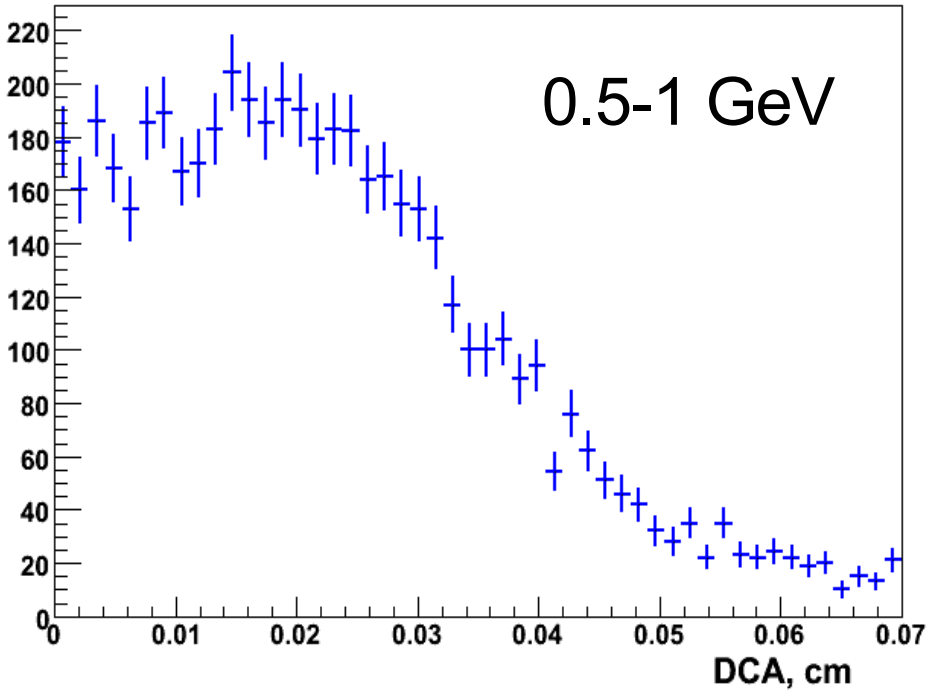


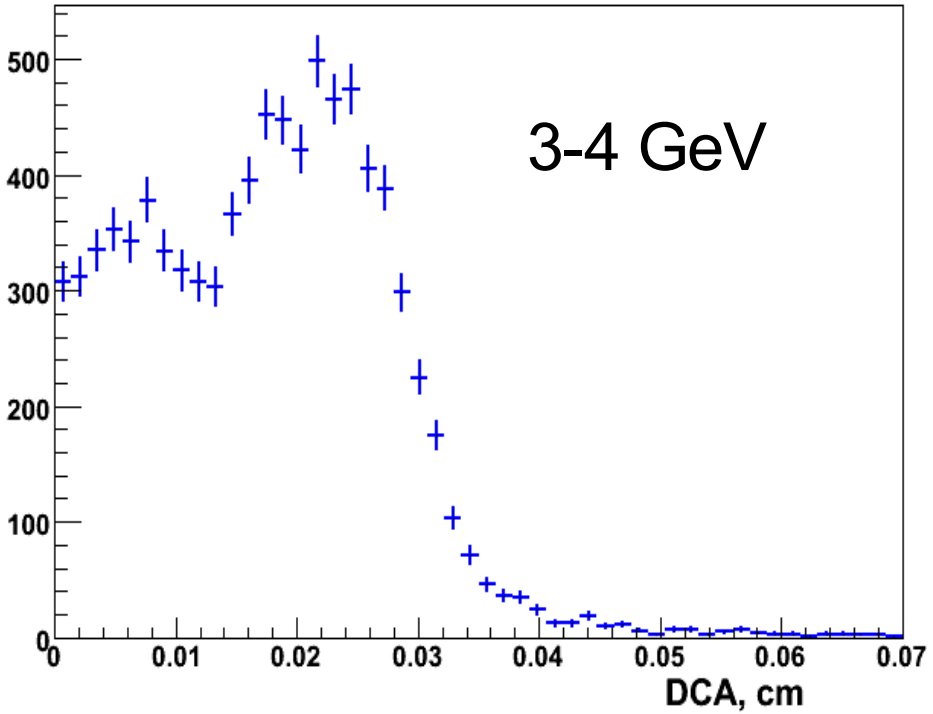


Cross-check with full simulation

Generated electrons with V_X = 200 μm, V_Y = 200 μm, but told KalFitReco that the vertex is at (0,0).

- Distance to the vertex 283 μm
- Reconstructed DCA
- No boost
- PHENIX geometry affects DCA distribution (better resolution in Y)





We need good DCA resolution to reject background from the vertex, but for c/b separation DCA resolution is not important, as long as it is less than cτ !